

# Characterization of Biochar Derived from Agricultural Residues as Potential Adsorbent for Extracting Phytohormones in Waste Coconut Water

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## Abstract

Coconut (*Cocos nucifera linn.*) is a key agricultural crop in the Philippines. The coconut industry produces huge volumes of waste including coconut husks, shells, and water. In this study, waste coconut water is utilized by extracting phytohormones from it using biochar as adsorbents. Phytohormones are valuable, naturally-occurring compounds that play essential roles throughout the different stages of plant growth. As such, they are widely used for plant propagation by tissue culture. For extraction, eight agricultural residues were studied as potential raw materials for biochar production: rice straw, bamboo, durian shells, calabash husk, banana peels, sugarcane bagasse, coffee husk, and cacao pods. The goal of the study is to convert the waste coconut water and agricultural residues into phytohormones that may then be reused by the agricultural sector. The residues were analyzed for moisture, volatile matter, fixed carbon, ash content, and then further characterized using Fourier-transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA). Conversion into biochar was done by pyrolysis at 500 °C for 1 hour with a heating rate of 16.67 °C/min. Pyrolysis yields ranged from 26.14% to 49.48% with the produced biochar having pore sizes between 134.9 nm and 3415 nm. Further treatment with KOH were done to improve the surface area and phytohormone adsorption capacity. Adsorption experiments were also performed on waste coconut water samples for 2 hours at room temperature and a loading rate of 100 g/L. The phytohormone adsorption capacity was measured using UV-Vis Spectroscopy by measuring absorbance at 267 nm. The biochar produced from agricultural wastes showed promising results as adsorbents for phytohormones.

**Keywords:** biochar, agricultural residues, bio-circular economy, adsorption ability, phytohormones

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